

Statement of
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Principal Deputy Assistant Secretary for Energy Efficiency and Renewable Energy
Before the
Subcommittee on Energy
Committee on Science
U.S. House of Representatives
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Madam Chairman and Members of the Subcommittee, I appreciate the opportunity to testify on the President's Fiscal Year 2006 Budget Request for the Office of Energy Efficiency and Renewable Energy (EERE). My focus today will be on the energy conservation, renewable energy, and hydrogen activities within our research and development programs.

The President's FY 2006 Budget includes \$1.2 billion for EERE. In his February 2nd State of the Union Address, the President underscored the need to restrain spending in order to sustain our economic prosperity. As part of this restraint, it is important that total discretionary and non-security spending be held to levels proposed in the FY 2006 Budget. The budget savings and reforms in the Budget are important components of achieving the President's goal of cutting the budget deficit in half by 2009 and we urge the Congress to support these reforms. The FY 2006 Budget includes more than 150 reductions, reforms, and terminations in non-defense discretionary programs, of which one affects EERE's programs. The Department wants to work with the Congress to achieve these savings.

The programs funded by this appropriation continue support for certain Presidential initiatives; build on research, development, and deployment successes already achieved; and focus on implementing results-oriented business practices to help achieve strategic energy goals and fulfill the Department's mission.

EERE has made good on its strategic goal of "changing the way it does business." Last fall, the National Academy of Public Administration (NAPA) completed an 18-month review of EERE's reorganized structure and noted in its final report, *Reorganizing for Results*, that "the basic construct of the reorganization—eliminating the sector organizations and restructuring around the major programs, and consolidating the business administration functions—was sound," and that "EERE has made great strides to reinvent how it does business." Our innovative business and management model is enabling EERE to fund the right mix of research and development (R&D) and to get

more technical work done effectively with the R&D dollars appropriated. EERE is also guided by the research and development investment criteria (RDIC) called for in the President's Management Agenda, as well as the Office of Management and Budget's (OMB) Program Assessment Rating Tool (PART) to guide its decisions and focus its R&D on long-term, high-payoff activities that require Federal involvement to be successful.

A primary long-term goal for our Nation must be to significantly reduce our dependence on foreign oil, and to develop the technologies that enable Americans to make greater use of our abundant, clean, domestic renewable energy resources. EERE's FY 2006 request continues support for the President's *Hydrogen Fuel Initiative* to ensure that hydrogen production, storage, and infrastructure technologies will be available and affordable when hydrogen-powered fuel cell vehicles are ready for commercialization. EERE also continues support for its *FreedomCAR* program (where CAR stands for Cooperative Automotive Research), working with industry to improve the efficiency and lower the cost of advanced combustion engines and hybrid vehicle technologies. In addition, EERE will pursue critical technical improvements to biorefineries and the processes that use biomass, the only renewable resource that can directly produce liquid transportation fuels such as ethanol.

But long-term results are only part of the story for EERE's programs. The Fiscal Year 2006 Budget Request is designed to provide results to the American people today by advancing technologies that are making their way into energy-related products and services that are an integral part of America's energy economy. Since 2001, research sponsored by EERE has won 37 R&D 100 awards, ten in 2004 alone. One technology winner this year is the world's first portable, flexible photovoltaic (PV) power module made from thin-film copper indium gallium selenide (CIGS). The U.S. Army is already using these lightweight PV systems that can be folded as small as a 9 by 12 envelope, stowed in a small backpack, and easily carried over long distances to supply efficient and reliable power.

Targeting all sectors of energy use, EERE's Fiscal Year 2006 activities are designed to make a difference in the everyday lives of Americans today, and an even greater difference in years to come.

ENERGY CONSERVATION AND RENEWABLE ENERGY PROGRAMS FISCAL YEAR 2006 REQUEST

EERE programs funded by the Energy and Water Development appropriation include Hydrogen and Fuel Cell Technologies, Vehicle Technologies, Solar Energy Technologies, Wind and Hydropower Technologies, Geothermal Technologies, Biomass and Biorefinery Systems, Weatherization and Intergovernmental, Distributed Energy Resources, Building Technologies, Industrial Technologies, Federal Energy Management, and Program Management and Direction.

HYDROGEN AND FUEL CELL TECHNOLOGIES

The Fiscal Year 2006 Budget Request for Hydrogen and Fuel Cell Technologies totals \$182.7 million: \$99.1 million for hydrogen activities, a \$5.1 million increase over the Fiscal Year 2005 comparable appropriation, and \$83.6 million for fuel cell activities, an \$8.7 million increase. Hydrogen and fuel cell technologies are the foundation of the President's *Hydrogen Fuel Initiative* and help support the Department's *FreedomCAR* program. Under the *FreedomCAR and Fuel Partnership*, government and industry are working together on research activities to overcome key technical barriers to commercialization of advanced efficient vehicles, and to facilitate a fuel cell hybrid vehicle and hydrogen infrastructure commercialization decision by industry in the year 2015. Because hydrogen fuel cell vehicles emit no criteria pollutants or carbon dioxide, their development and commercial success would essentially remove light-duty transportation as an environmental issue. The hydrogen will be produced from diverse domestic resources, making our Nation self-reliant for our personal transportation energy needs.

Much of the proposed increase in Hydrogen Technology is to accelerate and expand research and development of advanced technologies for producing hydrogen using renewable feedstocks such as biomass and renewable energy sources such as wind and solar. The program is also developing technologies for distributed hydrogen production from reforming of natural gas and from electrolysis. Other priorities include development of on-board vehicular hydrogen storage systems to achieve a driving range of greater than 300 miles and development of hydrogen delivery technologies. The ultimate goal is to reduce the cost of producing, storing, and delivering hydrogen to a cost competitive with that of gasoline.

Validation of fuel cell vehicle and hydrogen infrastructure technologies under 'real-world' operating conditions is essential to track progress and to help guide research priorities. This year's request contains \$24 million for fuel cell technology validation which is a 35 percent increase over the Fiscal Year 2005 comparable appropriation. We are also requesting \$14.9 million in funding for the validation of hydrogen infrastructure technology, a 58 percent increase over the Fiscal Year 2005 comparable appropriation. Automotive and energy partners are matching public dollars on a "50-50" cost-shared basis, and the Department is beginning to receive essential statistical data on the status of fuel cell vehicle and infrastructure technologies relative to targets in the areas of efficiency, durability, storage system range, and fuel cost. By measuring progress under real-world driving conditions, the Department can accurately monitor success in overcoming remaining fuel cell and infrastructure technology barriers and assess progress towards the 2015 commercialization decision by industry. These activities also provide technical information and analysis to support the development of codes and standards for the commercial use of hydrogen, and feedback on vehicle and infrastructure safety. Fiscal Year 2006 activities include opening eight hydrogen fueling stations, assessing performance and cost of hydrogen production and delivery technologies, and validating 1,000 hours of fuel cell vehicle durability "on the road." By 2009, the program is

expected to validate fuel cell vehicle durability of 2,000 hours, a 250-mile vehicle range, and hydrogen production cost of less than \$3.00/gge (gasoline gallon equivalent).

As highlighted by Secretary Bodman in earlier Congressional testimony, I am pleased to report that our fuel cell activities achieved an important technology cost goal this past year when they reduced the high-volume cost of automotive fuel cells from \$275 per kilowatt in 2002 to \$200 per kilowatt in 2004. This accomplishment is a major step toward the program's goal of reducing the cost of transportation fuel cell power systems to \$45 per kilowatt by 2010.¹ Research successes like this will enable a positive commercialization decision in 2015 that could lead to the market introduction of hydrogen fuel cell vehicles by 2020.

The President's *Hydrogen Fuel Initiative* was received by Congress with enthusiasm, and we appreciate this Subcommittee's support. However, while the EERE Fiscal Year 2005 comparable appropriation for hydrogen technology was \$94 million, 40 percent of those funds were earmarked for specific projects that are not wholly consistent with our research plan or the recommendations of the National Research Council. As a consequence, we must delay some very important work in areas such as hydrogen production and storage, and our ability to meet our established research targets in the specified timeframes may be in jeopardy. The Department looks forward to working with Congress to help ensure that the projects supported are consistent with our established goals in an effort to keep our progress on track.

VEHICLE TECHNOLOGIES

The *FreedomCAR* & Vehicle Technologies Program focuses on the development of more energy efficient and environmentally friendly technologies for cars and trucks that will use significantly less oil, and still preserve America's freedom of mobility. Many of these technologies also serve as the foundation of tomorrow's hydrogen fuel cell vehicles.

The Fiscal Year 2006 Budget Request for Vehicle Technologies is \$165.9 million, a \$0.5 million increase over the Fiscal Year 2005 comparable appropriation. Activities in this program contribute to two Departmental initiatives: the *FreedomCAR* initiative and the *21st Century Truck* initiative.

FreedomCAR activities in Fiscal Year 2006 focus on innovative, high-efficiency vehicle technologies including advanced combustion engines, advanced fuel formulations, hybrid vehicle systems, high-powered batteries, lightweight materials, and power electronics. These critical technologies can lead to near-term oil savings when used with advanced combustion hybrid electric vehicles and support the future development of hydrogen fuel cell hybrid vehicles.

FreedomCAR goals include increasing passenger and light-duty vehicle combustion engine efficiency from 30 percent to 45 percent by 2010 (while meeting 2010 EPA

¹ Cost of 50 kW vehicle fuel cell power systems estimated for production rate of 500,000 units per year.

emissions standards), and reducing the cost of high-power batteries for hybrid vehicles from \$3000 (1998 baseline) to \$500 for a 25kW battery by 2010. Combustion engine efficiency is making good progress, and in Fiscal Year 2006 we expect to reach 41 percent efficiency, a major step towards the 2010 goal of 45 percent. Battery technologies have also made significant progress toward these goals: the program reached its \$1,000 cost target for Fiscal Year 2004, and the Fiscal Year 2006 budget is expected to bring that down to \$750.

The *21st Century Truck* initiative has similar objectives but is focused on commercial vehicles. The 2006 request will fund cooperative research efforts between the commercial heavy-duty vehicle (trucks and buses) industry and major Federal agencies to develop technologies that will make our Nation's commercial vehicles more efficient, cleaner, and safer. The effort centers on R&D to improve engine systems, heavy-duty hybrids, truck safety, and to reduce parasitic losses (e.g., aerodynamic drag as the vehicle moves down the road at 60mph, and the power drain from belt driven accessories like power steering and air conditioning) and engine idling.

In Fiscal Year 2004, the heavy-duty vehicle activity demonstrated a reduction of parasitic losses from 39 percent baseline to 27 percent in a laboratory setting, and activities included in the Fiscal Year 2006 budget are expected to bring those losses down to 24 percent. The program also demonstrated an increase in heavy-duty diesel engine efficiency from the baseline of 40 percent to 45 percent in Fiscal Year 2004 (while meeting EPA 2007 emission standards) and we expect the Fiscal Year 2006 budget to raise that to 50 percent (while meeting EPA 2010 emission standards)—important steps toward meeting our long-term goal of 55 percent energy efficiency in 2013.

SOLAR ENERGY TECHNOLOGIES

The Solar Energy Technologies Program focuses research on advanced solar devices that can bring reliable and affordable solar energy technologies into the marketplace, helping our Nation meet electricity needs and reducing the stress on our critical electricity infrastructure. The Department's efforts are directed in the interrelated areas of photovoltaics, concentrating solar power (CSP), and solar heating and lighting. The Fiscal Year 2006 Budget Request for solar technology is \$84.0 million, which is roughly equivalent to the Fiscal Year 2005 comparable appropriation of \$85.1 million.

The Department's photovoltaic research and development is focused on next-generation technologies such as thin-film photovoltaic cells and leap-frog technologies such as polymers and nanostructures. The Fiscal Year 2006 request of \$75.0 million for photovoltaic energy systems includes \$31.4 million for critical laboratory research, \$28.6 million for advanced materials and devices, and \$15.0 million for technology development efforts to improve reliability of the entire system. The Department has included \$4.5 million in the Fiscal Year 2006 request to support the new Collaborative Crystalline Silicon Photovoltaic Initiative designed to strengthen through research and development the technological competitiveness of U.S. products in a rapidly growing world market.

The \$6.0 million request for concentrating solar power research includes funds to accelerate the development of next-generation parabolic trough concentrators and receivers. Development of advanced thermal energy storage technologies will continue and field validation will be conducted on new collector technology being deployed in trough projects in Arizona and Nevada. For distributed applications, research in Fiscal Year 2006 will focus on improving the reliability of dish systems through the operation and testing of multiple units at Sandia National Laboratory. Technical support will also be provided to the Western Governors' Association to assist their CSP deployment activities.

WIND AND HYDROPOWER TECHNOLOGIES

Wind Energy research and development promotes greater use of the Nation's fastest growing energy resource. Since 2000, installed wind turbine capacity in the United States has more than doubled, driven in large part by the tremendous reductions in cost that have resulted from wind energy research. Our research contributed to reducing the cost of electricity generation by a factor of 20 since 1982, to 4 cents or less per kilowatt-hour in areas with excellent wind resources.

The Fiscal Year 2006 Budget Request for Wind Energy is \$44.2 million, \$3.4 million more than the Fiscal Year 2005 comparable appropriation. Most of the Fiscal Year 2006 request is to fund R&D on multiple large wind system technology pathways in lower wind speed areas to achieve the goal of 3 cents per kilowatt-hour for onshore systems and 5 cents per kilowatt-hour for off-shore systems by 2012. Working in collaborative partnerships with industry, the Department plans to complete field testing of the first full-scale Low Wind Speed Technology prototype turbine in Fiscal Year 2006, and begin fabrication of a second prototype turbine (both 2.5 MW scale) which will enable electricity to be generated closer to where people live.

Hydropower is the most widely used form of renewable energy in the world today, accounting for over seven percent of total electricity generation in the United States and over 75 percent of domestic renewable electricity generation. The Department has supported the development of new turbine technology that reduces fish mortality associated with hydropower plant operation. With the completion of testing on new turbine technologies, and consistent with previous Congressional direction, the Department plans to close out the Hydropower Program and transfer remaining program activities and information to the private sector.

The Fiscal Year 2006 hydropower request of \$0.5 million will be used to complete the monitoring of plant operation and maintenance, and document previous program activities. Outstanding contracts will be closed out in Fiscal Year 2006.

GEOTHERMAL TECHNOLOGY

The Geothermal Technologies Program works in partnership with industry to establish geothermal energy as an economically competitive contributor to the U.S. energy supply.

Currently a \$1.3 billion a year industry, geothermal energy production generates electricity or provides heat for applications such as aquaculture, crop drying, and district heating, or for use in heat pumps to heat and cool buildings without the emission of greenhouse gases. The Fiscal Year 2006 Budget Request for Geothermal Technologies is \$23.3 million, a \$2.0 million decrease from the Fiscal Year 2005 comparable appropriation. The Fiscal Year 2005 appropriation included \$3.6 million in funds for congressionally-directed activities now completed.

In Fiscal Year 2006, the program will conduct extensive field tests of exploration technologies such as remote sensing techniques to increase the U.S geothermal resource base, and expand and accelerate the geothermal resource assessments conducted in collaboration with the U.S. Geological Survey. The program will continue its Enhanced Geothermal Systems (EGS) technology research to increase the productivity and lifetime of engineered reservoirs. The Department estimates that EGS technology could quadruple the amount of economically and technically viable geothermal resources in the West and open up new geothermal possibilities throughout the U.S.

BIOMASS AND BIOREFINERY SYSTEMS R&D

EERE's Biomass Program focuses on advanced technologies to transform the Nation's domestic biomass resources into high value fuels, chemicals, materials, and power. Working with the U.S. Department of Agriculture (USDA), the program leads a multi-agency initiative that coordinates and accelerates all Federal bioenergy R&D in accordance with the Biomass Research and Development Act of 2000.

In Fiscal Year 2006, the Department is requesting \$72.2 million for Biomass Program activities, \$15.9 million less than the Fiscal Year 2005 comparable appropriation. Last year's appropriation, however, included \$35.3 million in funds for congressionally-directed activities for which the Department is not requesting additional funds.

The Department requests \$43.4 million to support platforms R&D. The \$15 million request for Thermochemical Platform R&D will focus on developing technologies for the production, cleanup, and conditioning of biomass syngas and pyrolysis oils suitable for conversion to fuels and chemicals. This will be done in collaboration with industrial partners selected under a joint DOE/USDA solicitation issued in Fiscal Year 2004. The \$28.4 million requested for Bioconversion Platform R&D is to work with industry to improve the performance and reduce the costs of enzymes and biomass pretreatment, resulting in a low cost sugar stream in support of the nearer-term biorefinery.

The request also includes \$21.8 million for cost-shared R&D with U.S. industry to advance technologies that will convert this low cost sugar stream into affordable products (chemicals and materials), furthering the development of efficient biorefineries. Work with industry, universities, and the National Laboratories will focus on improving the efficiency of individual process steps such as catalysis and separations, with a focus on producing key building-block chemicals that have the potential to result in a multitude of high-value, renewable chemicals and materials.

WEATHERIZATION AND INTERGOVERNMENTAL PROGRAMS*

In Fiscal Year 2006, we are requesting \$310.1 million for Weatherization and Intergovernmental Activities, a \$15.7 million reduction from the Fiscal Year 2005 comparable appropriation. This includes \$230 million for the Weatherization Assistance Program, which will support weatherization of approximately 92,300 low-income homes, saving the low-income homeowner an average of \$274 annually on their energy bills at today's prices, according to estimates by the Oak Ridge National Laboratory.

The Department's Intergovernmental activities promote rapid deployment of clean energy technologies and energy efficient products. The Fiscal Year 2006 Budget requests \$41.0 million for State Energy Program grants. These grants, and the funds they leverage, allow State governments to target their own high priority energy needs and expand clean energy choices for their citizens and businesses.

In Fiscal Year 2006, we request \$4.0 million for the Tribal Energy Program which will enable the Department to continue to build partnerships with Tribal governments to assess Native American energy efficiency needs and renewable energy opportunities for residential, commercial, and industrial uses. These activities are helping to complete the foundational work that will encourage private sector investment in energy projects on Native American lands.

The Department includes an increase of \$1.7 million in its Fiscal Year 2006 request to expand and support Home Performance with ENERGY STAR®, an innovative residential program designed to improve the energy efficiency of existing homes by up to 30 percent using certified local contractors to perform whole-house retrofits. State and local pilot projects will be supported at the national level by the dissemination of best practices, contractor training, program design assistance, and marketing support.

* These programs are not R&D activities.

DISTRIBUTED ENERGY RESOURCES

By producing electricity where it is used, distributed energy technologies can strengthen our Nation's aging electricity power infrastructure, relieve congestion on transmission and distribution systems, and increase supplies during periods of peak demand. The Distributed Energy Program seeks to develop and deploy a diverse array of integrated distributed generation and thermal energy technologies that are competitively priced, reliable, and highly efficient. The Fiscal Year 2006 Budget Request for this program is \$56.6 million, a \$3.8 million reduction from the Fiscal Year 2005 comparable appropriation. This funding level reflects the reallocation of funds given the advances made in previous years and changes within the overall energy research and development portfolio. As in previous years, this year's request emphasizes integrated designs for end-use systems.

Key performance target goals for Fiscal Year 2006 include the development of a combined heat and power (CHP) system which operates at over 70 percent efficiency and a prototype microturbine which can achieve 35 percent efficiency for small-scale power generation. To help potential users take better advantage of distributed energy opportunities, the program will complete a state regulatory database including information on regulations such as environmental permitting, utility tariffs, and interconnection standards, and continue funding the eight Regional Combined Heat and Power Application Centers across the United States.

BUILDING TECHNOLOGIES

With an annual price tag of over \$250 billion, energy use by residential and commercial buildings accounts for nearly 40 percent of the Nation's total energy consumption, including two-thirds of the electricity sold in the United States. The \$58 million included in this year's request for the Building Technologies Program is a decrease of \$7.5 million from the Fiscal Year 2005 comparable appropriation, primarily due to reductions in space conditioning and building envelope R&D that is nearing commercialization. Fiscal Year 2006 activities include solid state lighting, improved energy efficiency of other building components and equipment, and their effective integration using whole-building-system-design techniques, and the development of codes and standards for buildings, appliances, and equipment.

The \$18.3 million request for Residential Buildings Integration aims to develop design packages that enable residential buildings to use 40 to 50 percent less energy than current practice, and integrate renewable energy systems into highly efficient building designs and operations in working toward the ultimate goal in 2020 of net Zero Energy Buildings: houses that produce as much energy as they use on an annual basis.

As part of the Department's focus on longer-term, high-risk activities with great potential for public benefit, in Fiscal Year 2006 we are requesting \$11 million for solid state lighting research. Solid state lighting holds the potential to more than double the efficiency of general lighting systems, revolutionizing the energy efficiency, appearance, visual comfort, and quality of lighting products.

The Fiscal Year 2006 request also reflects the Department's continued commitment to advancing buildings codes and appliance standards. Because key analyses and peer reviews for several priority appliance rulemakings will be completed in Fiscal Year 2005, funding requirements for Fiscal Year 2006 will be reduced in this area.

FEDERAL ENERGY MANAGEMENT PROGRAM

The Federal Energy Management Program (FEMP) and the Departmental Energy Management Program (DEMP) assist Federal agencies and the Department in increasing their use of energy efficiency and renewable energy technologies through alternative financing contract support, technical assistance, and funding for retrofit projects. By using existing energy efficiency and renewable energy technologies and techniques, the

Federal Government can set an example and lead the Nation toward becoming a cleaner, more efficient energy consumer.

FEMP's Fiscal Year 2006 request is \$19.2 million, a \$0.7 million reduction from the Fiscal Year 2005 comparable appropriation. We are requesting \$6.8 million for FEMP technical support that promotes agency use of alternative financing tools, which allow Federal agencies to access private sector financing to fund energy improvements through Energy Savings Performance Contracts (ESPC) and Utility Energy Service Contracts (UESC) at no net cost to taxpayers. In addition, we are requesting \$7.7 million for Technical Guidance and Assistance activities to help Federal energy managers identify, design, and implement new construction and facility improvement projects that incorporate energy efficiency and renewable energy.

INDUSTRIAL TECHNOLOGIES

The Industrial Technologies Program seeks to reduce the energy intensity of the U.S. industrial sector through a coordinated program of R&D, validation, and dissemination of energy-efficiency technologies and operating practices. The Department is working to achieve the program's goals by partnering with domestic industry, its equipment manufacturers, and its many stakeholders.

The Fiscal Year 2006 Budget Request is \$56.5 million, an \$18.3 reduction from the Fiscal Year 2005 comparable appropriation. We strongly believe that this level of funding is sufficient because the Industrial Technologies Program is becoming more focused and more strategic in its investments in next-generation industrial technologies. The Program's strategic approach is based on developing a focused, multi-year plan that is designed to identify a limited number of high-priority, energy-saving research and development opportunities, characterize the technical barriers associated with each of those opportunities, and implement a multi-year development pathway to achieve success in each identified focus area. Many of these R&D efforts will be in exploratory phases in Fiscal Year 2006 as the program identifies the most promising technology areas and adopts a balanced portfolio of high-risk, high-return R&D.

PROGRAM MANAGEMENT AND DIRECTION

The Program Management (Energy Conservation) and Program Direction (Energy Supply) budgets provide resources for executive and technical direction and oversight required for the implementation of EERE programs. The Budget Request covers Federal staff as well as the equipment, supplies, materials, information systems, technology equipment, and travel required to support management and oversight of programs. Also funded by this request are properties; public information activities; support service contractors; and crosscutting performance evaluation, analysis and planning.

The Fiscal Year 2006 Budget Requests for Program Management and Program Direction total \$108.1 million, representing a \$4.0 million (3.6 percent) decrease from the Fiscal Year 2005 comparable appropriations. The decrease primarily reflects completion of the

National Academy of Science review, the absence of support for prior congressionally-directed activities, and the movement of support service funding for the Climate Change Technology Program out of this request. With these activities excluded, our request actually represents an increase of \$4.9 million to support our efforts to improve project management and to more accurately report our true cost of doing business. We also request \$2.9 million within Renewable Program Support for crosscutting analysis and planning, which was formerly funded within individual renewable program budgets.

CONCLUSION

Madam Chairman, we believe the Administration's Fiscal Year 2006 Budget for energy efficiency, renewable energy, and hydrogen research, development, demonstration and deployment programs will contribute to improved energy security by promoting a diverse supply of reliable, affordable, and environmentally sound energy, and by promoting the efficient use of energy.

This completes my prepared statement, and I am happy to answer any questions the Subcommittee may have.

